MARKED-UP SPECIFICATION

TITLE: METHOD OF PREVENTING RECORDING ON A DISC-LIKE
RECORDING MEDIUM OF THE OPTICALLY REWRITABLE TYPE

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METHOD OF ~~HIDING AREAS~~PREVENTING RECORDING ON A ~~DISC~~DISC-LIKE RECORDING MEDIUM OF THE OPTICALLY REWRITABLE TYPE

~~Method of preventing recording on a disc-like recording medium of the optically rewritable type.~~

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001]   This is a continuation of U.S. Patent Application Serial No. 09/685,553, filed October 10, 2000, now U.S. Patent 6,704,263.

BACKGROUND OF THE INVENTION

Field Of The Invention

[0002]   The invention relates to a method of preventing recording on a ~~disc~~disc-like recording medium of the optically rewritable type, the method comprising applying a pre-groove on the ~~disc~~disc-like recording medium adapted to write data therein in accordance with a first write strategy, reserving a program calibration area (PCA) for optimum power control (OPC) and/or a program memory area (PMA) for temporarily storing a table of content (TOC) on said ~~disc~~disc-like recording medium.

[0003]   The invention further relates to a recording apparatus adapted for recording digital information signals on a ~~disc~~disc-like recording medium of the optically rewritable type, said apparatus comprising input means for receiving digital information signals,

encoding means for coding the received digital information signals for recording on the ~~disc~~ disc-like recording medium, writing means for writing optically detectable marks representing the encoded information signals on the ~~disc~~ disc-like recording medium in

5   accordance with a first write strategy, address determining means for locating, on the ~~disc~~ disc-like recording medium, a program calibration area (PCA) to be used for a optimum power control (OPC) procedure, and/or a program memory area (PMA) to be used for temporarily storing a table of content (TOC).

10   **[0004]**   The invention also relates to a ~~disc~~ disc-like recording medium of the optically rewritable type ~~according to the preamble of claim 6~~ having a pre-groove adapted to record data therein in accordance with a first write strategy, a Program Calibration Area (PCA) adapted to be used in a Optimum Power Control (OPC) procedure

15   and/or, a Program Memory Area (PMA) adapted to temporarily store a table of content (TOC).

Description Of The Related Art

[0005]   A ~~disc~~ disc-like recording medium of the optically type

20   is disclosed, for instance, in European Patent No. 390 268 (PHN13148), which is incorporated herein by reference ~~herein~~. Such a disc which allows recording apart from playback may be referred to as a CD-Recordable (CD-R), a CD-Erasable (CD-E) or a CD-Rewritable (CD-RW).

[0006]   As the name implies, CD-RW is a media and recording
system that allows the user to erase previously recorded
information and then to record new information in its place, making
short-term storage feasible on CD media. This is accomplished by
5   means of a new CD-RW media using "phase change" technology that
allows a recording laser beam to change the media material from
amorphic to crystalline by means of a shift in power.

[0007]   The first generation of CD-RW discs are designed for
speed applications covering a range of 1 times - 4 times the
10 nominal speed of a conventional CD-ROM disc, being approximately
150 kbs. The next generation CD-RW discs however will designed for
high high-speed applications ranging from 4 times - 10 times this
nominal speed. Because of the typical behavior of phase change
materials, these discs need a new write strategy, which is not
15 suited for recording at lower speeds. Furthermore, the existing
write strategies defined for 1X, 2X and 4X recording speed, do not
work on these new discs.

[0008]   Some of the existing CD-RW recorders, designated to
operate with the lower speed ranges, are recognizing the new high
20 high-speed discs and reject them. But others will accept these
discs and make recordings on them according to one of the existing
write strategies, for instance default at 2X speed. These
recordings will result in unreadable signals, thereby destroying
previously recorded information.

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SUMMARY OF THE INVENTION

[0009]   ~~In consequence, amongst other things, it~~It is an object of the invention to obviate the above-mentioned disadvantages. According to one ~~of its aspects~~aspect, a method according to the

5   invention is characterized by making one or both of said areas untraceable for recording devices adapted to write data on a ~~disc~~ disc-like recording medium in accordance with a second, different write strategy.

[0010]   As both areas are needed by a recorder, hiding these

10   areas for existing recorders, designed to operate with low speeds, will result in rejecting of the disc.

[0011]   ~~With~~In a method comprising applying absolute time reference (ATIP) information in the pre-groove on the ~~disc~~ disc-like recording medium, in which start locations of said areas are

15   being determined by a fixed time offset relative to a subsequent Lead-in area, an advantageous embodiment thereof is characterized by introducing an ATIP time code jump to ATIP time codes before the start of the Lead-in area. The ~~Pre~~Pre-Groove of a CD-RW disc contains an Absolute Time Reference in the ~~Pre~~Pre-Groove. As the

20   locations of the PCA and PMA areas are determined by a fixed offset relative to the Start time of the Lead-in areas, these areas are made untraceable.

[0012]   Further advantageous embodiments of a method according to the invention are disclosed in the description, as well as

embodiments of a ~~disc~~ disc-like recording medium and recording apparatus according to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

5   **[0013]**   These and further aspects and advantages of the invention will be discussed in more detail hereinafter with reference to the disclosure of preferred embodiments, and in particular, with reference to the ~~appended Figures that show~~drawings, in which:

[0014]   Fig. 1 is a chart showing an existing ATIP versus disc

10   diameter;

[0015]   Fig. 2 is a chart showing a modified ATIP versus disc diameter, modified according to a first embodiment of the invention;

[0016]   Fig. 3 is a chart showing the detailed organization of

15   the PCA, PMA and Lead-in area of Fig.2, modified according to a second embodiment of the invention;

[0017]   Fig. 4 is a chart showing a modified ATIP versus disc diameter, modified according to a third, preferred embodiment of the invention; and

20   **[0018]**   Fig. 5 shows a schematic block diagram of a recording apparatus according to an embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019]   In a CD-RW, there are two areas preceding the Lead-in

25   area that are reserved for use by the recorder. The Power

Calibration Area (PCA) ~~meant~~ is intended for making test recordings to determine the optimal write power for the actual disc.~~-~~ Every time a disc is inserted into a CD-RW drive, the laser is fired at the surface of the PCA to judge the optimum power setting for

5   burning the CD. Various things can influence this optimum setting - the recording speed, humidity, ambient temperature and the type of disc being used. The Program Memory Area (PMA) is ~~meant~~ intended to store a temporary Table of Content (TOC). A TOC contains track numbers and their start and stop times (for music), or sector

10   address for the start of data files on a data CD.

[0020]   The Information Area, i.e., the area of the disc which contains data, is divided into three areas~~:~~, notably, the Lead-in area, the Program Area and the Lead-out area. The Lead-in area contains digital silence in the main channel plus the Table of

15   Contents (TOC) in the subcode Q-channel. ~~It~~ The Lead-in area allows the laser pickup head to follow the pits and synchronize to the audio or computer data before the start of the program area. The Program Area contains up to about 76 minutes of data divided into 99 tracks maximum. The Lead-out area contains digital silence or

20   zero data. This defines the end of the CD program area.

[0021]   Both PCA and PMA areas are needed by the recorder~~, so that~~. As such, if they can be hidden from existing recorders for low application speeds, these recorders cannot perform an Optimum Power Control (OPC) procedure and can~~-~~not read the temporary TOC.

25   As a result, these recorders will reject the disc.

[0022]   The locations of the PCA and PMA areas are determined by a fixed time offset relative to the Start_time of the Lead-in area, as illustrated in Fig. 1

[0023]   On the new generation of high speed discs, the PCA and

5   PMA could be made untraceable, according to a first embodiment of the invention, for existing drives by introducing an ATIP time code jump of, for instance, 1 minute just before the Start_time of the Lead-in area. In other words—:, all ATIP time codes up to the Start time of the Lead-in area are reduced by one minute, as illustrated

10   in Fig. 2.

[0024]   Existing drives cannot distinguish between old and new discs and, therefore, will search for an ATIP time code (t3-00:35:65) or (t3-00:13:25) to find the PCA respectively or the PMA, respectively, which they find on old discs, but never find on new

15   discs. As a result they will reject the new discs.

[0025]   New drives or upgraded drives adapted to operate with high speed discs at higher speed applications, can recognize the new discs and know about the existence of the ATIP time code jump, and will search for (t3-01:00:00 - 00:35:65) or (t3-01:00:00 -

20   00:13:25) to find the PCA, respectively or the PMA, respectively, on new discs.

[0026]   However, because some recorders are using the PMA also for access during play-back, an advantageous second embodiment leaves the PMA untouched. In order to achieve this, the ATIP Time

25   Code jump is chosen as illustrated with reference to Fig. 3. To

have some buffer area before the PMA, which might be useful for good access control, the time code jump could possibly be better located just after the last used frame of the count area in the PCA as illustrated in FIG. 3. Herein, T_{SL} = t_3 = Start ~~TIME~~ time Lead-

5   in.

[0027]   Fig 4 shows a preferred third embodiment according to the invention. As shown in Fig. 4, the power calibration area PCA is divided into two areas. A first area is a Test Area, in which tests can be performed to obtain correct reading power for a disc. A

10   second area is a Count Area, where it can be read which part of the Test Area can be used. Both areas of the PCA are divided into partitions, which must be used in sequential order, starting from partition number one. The PCA can be used many times~~:~~, i.e., once all partitions have been used, the total PCA must be erased, after

15   which it is available for the next sequence of power calibration procedures. The ATIP jump location is, with respect to the embodiments shown in Fig. 2 and Fig. 3, shifted into the buffer area between the PCA Test Area and the PCA Count Area. This results in a distance between the ATIP jump and the PMA area of 2 minutes.

20   This gives the advantage of more space for drives to access the PMA. As some drives may employ the Program Memory Area (PMA), the available free space or buffer area may be insufficient for the use as explained with reference to Fig. 2 and Fig. 3. It is noted that drives expect PCA Test partitions from 96:51:30 to 97:11:29.

[0028]   Next an embodiment of a recording apparatus according to
the invention will be described, with reference to Fig. 5. The
recording apparatus 1 comprises recording medium receiving means 2
for receiving a removable recording medium 3. The recording medium

5   3 may be a disc of the optically rewritable type, such as CD-RW,
DVD-RAM or DVD-RW. The recording medium 3 is rotationally driven by
rotation means 4. An optical pick-up unit 5, movable in a radial
direction of the recording medium 3, writes optically detectable
marks along a spiral track 8 on the recording medium 3 employing a

10 light beam 6. To this ~~purpose~~ end, the recording medium 3 is
provided with a suitable ~~phase~~ phase-change material which has
different optical properties in crystalline or amorphous states.
Heating with the light beam 6 may induce these states. The light
beam 6 is modulated by recording means 9 according to digital

15 information signals to be recorded. These digital information
signals have been suitable encoded ~~with~~ by encoding means 10,
employing EFM modulation and CIRC error encoding, as prescribed by
the CD-standards. Input means 11, which may comprise A/D conversion
means and/or special interface circuitry, may receive analog and/or

20 digital information signals.

[0029]   Alternatively, recorded digital information signals on
the recording medium 3, may be read via the same optical pick-up
unit 5, by suitable reading means 13. ~~These are~~ The reading means 13
is connected to decoding means 14 ~~to perform~~ for performing EFM

25 decoding and CIRC error correction processing. The decoded and

corrected signals are outputted, via outputting means 15, which may comprise D/A means and/or suitable interface circuitry, digital and/or analog information signals.

[0030]   In addition, address finding means 12 ~~are~~ is provided to

5 determine address information present on the recording medium 3. Such address information, for example, in the form of absolute time codes, may be recorded in the track 8 by means of a pre-formed track modulation as disclosed in European Patent No. 390 268 (PHN 13148). Such a track is described in more detail in the Dutch

10 Patent Application NL-A-8800152, corresponding to U.S. Patent 4,999,825 (PHN 123999). The address finding means 12 derives an address signal from the signal components in the detection signals which are caused by the pre~~f~~-formed track modulation. The address signal is supplied to the controlling unit 16.

15 **[0031]**   All units are controlled by the controlling unit 16. The controlling unit 16 may comprise a processing unit which operates according to a specific program loaded in memory means, in order to perform the method according to the invention.

[0032]   Specifically, the controlling unit 16 comprises

20 information relating to the time jump in the Absolute Time Reference (ATIP) as may be present in the recording medium 3, as described before. This enables the recording apparatus 1 to locate the ~~previous~~ previously-mentioned areas on a recording medium 3 to be used for an Optimum Power Control (OPC) procedure and/or

25 recording of a temporary table of content (TOC).

[0033]   Although the invention has been described with reference
to a preferred embodiment thereof, it is to be understood that
these are not limitative example. Thus, various modifications
thereof may become apparent to those skilled in the art, without
5   departing from the scope of the invention, as defined by the
claims. The invention may be implemented by means of both hardware
and software, and that several "means" may be represented by the
same item of hardware. Further, the invention lies in each and
every novel feature or combination of features. It is also remarked
10   that the word "comprising" does not exclude the presence of other
elements or steps than those listed in a claim. Any reference signs
do not limit the scope of the claims.

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ABSTRACT~~:~~ OF THE DISCLOSURE

A next generation of ~~high~~ high-speed CD-RW discs for ~~high~~ high-speed recording (4x-10x) need<u>s</u> a new write strategy, which is

5   not suited for recording at lower speeds (1x-4x). Existing CD-RW recorders may accept these discs and make recordings according to existing write strategies. This will result in unreadable discs. To prevent this, a Power Calibration Area (PCA) and a Program Memory Area (PMA), both needed for recording, are hidden for the existing

10 recorders. As a result the disc will be rejected. In a method wherein an absolute time reference (ATIP) is applied on the disc, the start locations of ~~said~~ these areas being determined by a fixed time offset relative to a subsequent Lead-in area, ~~an embodiment of the invention is obtained by making~~ the PCA and PMA <u>are made</u>

15 untraceable by introducing and Absolute Time in Pre-Groove (ATIP) time code jump of<u>,</u> for instance<u>,</u> one minute just before the Start time of the Lead-in area. ~~Another embodiment is obtained by introducing~~Alternatively, the absolute Time in Pre-Groove (ATIP) time code jumps <u>are introduced</u> between a Test Area and a Count Area

20 of the program calibration area (PCA).

~~Fig. 2~~